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Bachelor's Thesis

Productization of Configuration Version builder

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PREFACE

This thesis was made on commission for L M Ericsson Oy. I want to thank all the people of Ericsson and my friends who have helped me with this thesis.

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Hannu Pekkonen

TIIVISTELMÄ

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Ericsson käyttää Media Gateway:n konfigurointiin CCR-tool työkalua. Konfiguroitaessa tapahtuu kuitenkin paljon virheitä ja siksi Ericsson on kehittänyt CVbuilder-ohjelman konfigurointivirheiden vähentämiseksi. CVbuilderia ei kuitenkaan ole tuotteistettu eikä sillä ole asianmukaista tuotekehitystä.

Tämä insinöörityö tehtiin Ericssonin GSDC -yksikölle ja työn tarkoituksena oli tuotteistaa CVbuilder sekä dokumentoida se. Lisäksi tarkoituksena oli myös selvittää, mikä Ericssonin osastoista voisi ottaa CVbuilderin hallintaansa, jotta sille saataisiin asianmukainen tuotekehitys ja ylläpito.

Tässä työssä esitellään Ericssonin osastoja, joilla olisi tarvittavat resurssit CVbuilderin hallintaan ja esitelllään Ericssonin Media Gateway:tä tietoliikenneverkossa. Ericssonilla on käytössään oma Software Deployment Preparation -prosessi, jota asiantuntija noudattaa valmistellessaan SW -päivityksiä asiakkaan verkkoon. CCR-tool on yksi työkaluista, joita käytetään näissä projekteissa. Yksityiskohtainen tieto CVbuilderstä on kerätty haastattelemalla ohjelman kehittäjää sekä tämänhetkistä ylläpitäjää.

Tuotteistaminen aloitettiin dokumentoimalla CVbuilder käyttäen apuna Ericssonin Corporate Basic Standard -kirjastoa ja ABC- ja DEC -rekistereitä. Tämän jälkeen CVbuilderin tuotteistaminen tapahtui PIwin –ohjelmalla. Näin saatu dokumentti saatiin tallennettua Ericssonin tietokantaan oikealla tuotenumerolla ja Cvbuilder siten tuotteistettua.

Nyt kun CVbuilder on tuotteistettu ja siirtyy uudelle omistajalle, seuraavina tehtävinä voisi hyvinkin olla CVbuilderin rakenteen dokumentointi tai esimerkiksi CVbuilder- koodin selvittäminen.

Avainsanat: CVbuilder, CCR-tool, Media Gateway, tuotteistaminen

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ABSTRACT

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Ericsson uses CCR-tool to configurate Media Gateway (MGw). However when the configuration file has many pages, experts make errors. That is why Ericsson's employee has programmed a new sub software tool for CCR-tool. With this new software tool, the experts' errors are reduced and work efficiency is improved. This new tool is called CVbuilder.

This thesis was made for Ericsson Global Service Delivery Center (GSDC) -unit, and its purpose was to productize CVbuilder and document it. Also one purpose was to solve which Ericsson's department could take control of the CVbuilder, so proper product development and maintenance of the CVbuilder could be obtained.

In this thesis the departments of Ericsson are presented, which would have the necessary resources to CVbuilder's management. Furthermore, Ericsson's MGw on correct network is presented. Ericsson has its own Software Deployment Preparation process that experts follow when making updates in a customer's network. CCR-tool is one of the tools used in these projects. Detailed information of CVbuilder has been collected by interviewing the developers of the program and the current administrator.

Productization began by documenting the CVbuilder using Ericsson's Corporate Basic Standard Library, the ABC and DEC-register. Then the CVbuilder productization was implemented by using PIwin program. This document was stored on to the Ericsson database under the correct product number and CVbuilder was successfully productized.

Now that CVbuilder is a product and given to a new owner, the following tasks could well be the documentation of the CVbuilder's structure or for example clearing and reorganization of the CVbuilder code and documentation.

Keywords: CVbuilder, CCR-tool, Media Gateway, productization

ABBREVIATIONS

2G	Second generation Mobile Communications Technologies
3G	Third generation Mobile Communications Technologies
3GPP	3rd Generation Partnership Project'
AAL2	ATM Adaptation Layer 2
ATM	Asynchronous Transfer Mode
AXE	Product Name of Ericsson Switching System platform for mobile and fixed networks
BETE	Business Unit Ericsson Test Environments
BSC	Base Station Controller
BSS	Base Station System
BUGS	Business Unit Global Services
CCP	Connectivity Packet Platform
CCRform	Customer Configuration Requirements form
CCR-tool	Customer Configuration Requirement tool
CPP	Connectivity Packet Platform
CPPEmu	CPP Emulator
CS	Customer Support
CS	Circuit Switch
CSR	Customer Service Request
CV	Configuration Version
DT	Data Transcript

EDGE	Enhanced Data rates for GSM Evolution
EIR	Equipment Identity Register
ELS	Ericsson Local Support
EMEA	Europe, Middle East, Africa
ET	Exchange Terminal
FI	First Network Implementation
FTP	File Transfer Protocol
GCP	Gateway Control Protocol
GGSN	Gateway GPRS Support Node
GMSC	Gateway MSC
GPRS	General Packet Radio Service
GSD	Global Service Delivery
GSDC	Global Service Delivery Center
GSM	Global System for Mobile Telecommunication
HLR	Home Location Register
IP	Internet Protocol
IPMM	Internet Protocol Multimedia
ISDN	Integrated Services Digital Network
MGw	Media Gateway
M-MGw	Media Gateway for Mobile Networks
MO-script	Managed Object script
MS	Mobile Station
MSC	Mobile Switching Center

MSC-S	MSC Server
MSS	Mobile Softswitch Solution
MU	Market Unit
OSS	Operating Support System
PDU	Product Development Unit
PLMN	Public Land Mobile Network
PSTN	Public Switched Telephone Network
RAN	Radio Access Network
RBS	Radio Base Station
RCA	Route Cause Analysis
RNC	Radio Network Controller
SGSN	Serving GPRS Support Node
STM	Synchronous Transfer Mode
SWDP	Software Deployment Preparation
TDM	Time Division Multiplexing
TSC	Transit Services Switching Center
UE	User Equipment
UMTS	Universal Mobile Telecommunication Systems
WCDMA	Wideband Code Division Multiple Access

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1 INTRODUCTION

Ericsson is a world leading telecommunication equipment manufacturer. More than 40 percent of mobile communications are utilizing Ericsson equipment.

From the thesis point of view the most important Ericsson equipment is Media Gateway. One of the missions of Finland Ericsson GSDC Unit is the configuration of Media Gateway. The main purpose of the Media Gateway is to handle the processing and transporting of conversational data in mobile networks. For Media Gateway would function as wanted, should the Media Gateway scripts be configured by using the right tool and for that Ericsson uses the CCR-tool.

These CCR-tool configurations are made by experts, but when the configuration file has many pages, the experts make errors. That is why one of Ericsson's employees has programmed a new sub software tool for CCR-tool. With this new software tool, the experts' errors are reduced and work efficiency is improved. This new tool is called CVbuilder.

CVbuilder has been administered by GSDC Finland, but the CVbuilder has no product development and actually the entire CVbuilder has not been productized at all.

This thesis was made on commission for L M Ericsson Oy in Jorvas, where one of the Ericsson Global Delivery Centers is located. The purposes of this thesis are to productize CVbuilder and to get CVbuilder administrated by one of Ericsson's departments, so that product development, product support and maintenance of the CVbuilder could be enabled. At the same time, the CVbuilder is documented.

Following chapters deal with Ericsson Finland's unit, Media Gateway in Ericsson network, network deployment and integration, CVbuilder and its productization.

2 ERICSSON FINLAND UNITS

This thesis was made for Ericsson's GSDC Unit, which currently manages CVbuilder. The purpose of this thesis was to productize CVbuilder and to clarify which of Ericsson's units could be the next administrator of the CVbuilder. That is why it is important to introduce these units.

The purpose of this chapter is to describe Finland's Ericsson units which are related to this thesis. The units are Ericsson's Business Unit Global Service (BUGS), Global Service Delivery Center (GSDC) and Business Unit Ericsson Test Environments (BETE).

2.1 Business Unit Global Services

Business Unit Global Services secures the delivery of services to Ericsson's customers, the network operators and service providers, via the Market Units.

Business Unit (BU) Global Services is one of Ericsson's three Business Units. The organization consists of four Product Areas (PA), three Functional Areas (FA), three Staff Functions (SF) and two Special Units. The main tasks of the Business Unit Global Services are:

- Develop and deploy global service delivery strategy, policies, directives and guidelines
- Develop and implement service delivery process, tools and IT support systems
- Develop strategic and tactical service delivery plans including capacity requirements, resource mix, efficiency targets and delivery chain cost
- Drive service delivery competence and resource management
- Monitor and take actions on service delivery performance globally
- Manage Global Service Delivery Centers
- 3rd line support. [1]

2.1.1 Product areas

Product areas consist of Consulting and Systems Integration, Network Roll-out, Manage Services and Customer Support. Product areas are responsible for development, marketing, sales support, managed services, support

services, customers consulting and integration of Ericsson and third party products in the service and telecom management layers. [1]

2.1.2 Functional Areas

Functional Areas consist of Business Management and Marketing, Global Service Delivery and Partnering & Sourcing. It is responsible for the BUGS Strategies, Ericsson's global service delivery organization and it provides direction and support of Ericsson’s Global Services. [1]

2.1.3 Staff Functions

Staff Functions consist of Financial and Operational Developments, Human resources & Organization and Communications. Its responsibility is to provide high quality financial information and other decision support, Global Service strategies and objectives by providing processes, tools and methods and provide an easy and simple description of Ericsson's strategies. [1]

2.1.4 Special Units

BETE (Business Unit Ericsson Test Environments) provides an efficient test environment operation to Ericsson users and to customers globally in the TTM & TTC processes. The main responsibility is with the management of the resources, and the supply of test environment to the user base. This includes the configuration, maintenance and support of the respective test environments and test equipment. It helps to minimize capital expenditures and costs of operations and will operate as the only internal test service provider. [1]

2.2 Global Service Delivery Center

Global Service Delivery Center (GSDC) Finland belongs to Ericsson's Business Unit Global Services. GSDC are divided according to geographical region. GSDC Finland is part of the GSD EMEA (Europe, Middle East, and Africa) north region and is responsible for delivering services and resources to other Ericsson organizations and Ericsson's customers within the following competence areas:

- Core Network
- Access Network
- Customer Project Management

- Telecom Management, Service Layer and Multi Media Solution.

These services and resources mentioned above consist of supply and support activities such as design, integration, and implementation, consulting and troubleshooting. In other words, GSDC acts as a 2nd line service supplier in the support chain, whose purpose is among other tasks to deliver technical solutions to customers. [2]

2.3 Business Unit Ericsson Test Environments

Finland has one of Ericsson's Business Unit Test Environments, BETE Finland. BETE belongs to EMEA North Region. BETE maintain test equipment, operated by a local GSDC's and R&D, In addition to providing remote access from other Ericsson departments. BETE test unit equipment is so extensive that it could run the entire Finnish and Swedish mobile phone traffic. [3, 4]

BETE provides coordinated and cost efficient test environments for internal Ericsson groups and external customers. It provides services to Global System for Mobile Telecommunication (GSM), General Packet Radio Service (GPRS) and Universal Mobile Telecommunication Systems (UMTS) networks, simulated test environments, labs for special purposes, remote connection and hosted test environments. [3, 4]

BETE has end-to-end responsibility for the entire process, from configuration to maintenance & support, continued development of the test environment and test equipment. [3, 4]

3 MEDIA GATEWAY IN ERICSSON NETWORK

CVbuilder is one part of Media Gateway configuration tools. That is why it is important to know more about Media Gateway.

The purpose of this chapter is to describe basic principles Universal Mobile Telecommunication Systems (UMTS) networks and from the point of view of Ericsson, Mobile Softswitch Solution (MSS), Media Gateway (MGw) and Connectivity Packet Platform (CPP).

3.1 Universal Mobile Telecommunication Systems

UMTS is one of the 3rd generation networks, which is used in Europe. UMTS networks are built on top of an enhanced GSM Core Network. This enables existing GSM network operators to secure their 2G investments and reduces the implementation risks and costs of UMTS. The most important step of GSM towards UMTS is to handle packet data with GPRS. The GSM and GPRS nodes are reused in the UMTS Core Network. [5]

UMTS use a Wideband Code Division Multiple Access (WCDMA) technology, which enables a larger bandwidth. Because of that, it supports basic voice, text and MMS services, it also enables mobile multimedia services such as music, TV and video, entertainment content and Internet access. To enable a larger bandwidth, it requires a new Radio Access Network called WCDMA RAN and the enhanced GSM Core Network. Figure 1: GSM & WCDMA Network nodes describe UMTS network architecture [5]

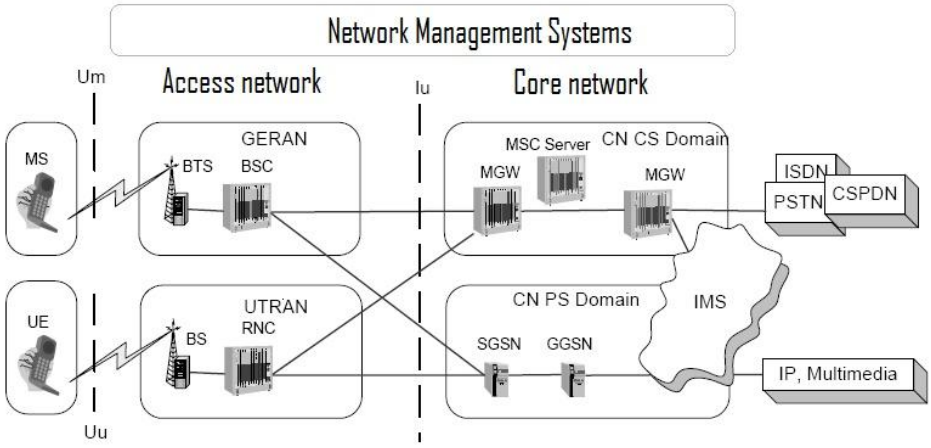

Figure 1: GSM & WCDMA Network nodes

The next subsections WCDMA RAN and WACDMA Core Network describe these in detail.

3.1.1 WCDMA Radio Access Network

The WCDMA Radio Access Network consists of Radio Network Controllers (RNC) (see figure 1 on page 5), which is the service access point for all WCDMA RAN providing services to the Core Network and Radio Base Stations (RBS), which provide the radio resources and converts the data flow between User Equipment and Core Network. [5]

3.1.2 WCDMA Core Network

The WCDMA Core Network Architecture is based on an evolved GSM Core Network. It is common for GSM, General Packet Radio Service (GPRS), Enhanced Data Rates for a Global Evolution (EDGE) and WCDMA network solutions. [6]

The Core Network contains a range of nodes to support circuit or packet switched services belonging to the service classes (see figure 1 on page 5). The WCDMA Core Network is logically divided into domains related to the type of the offered service. These are:

- Telephony (Circuit Switched, CS) domain.
- Packet Switched (PS) domain.
- Transport domain.
- Support Domain
- Multimedia Domain.

Internet Protocol Multimedia (IPMM) subsystem provides operators with the ability to leverage their initial investment for push-to-talk services and gradually expand their Internet Protocol (IP) network as new multimedia services are introduced to subscribers. Ericsson Instant Talk is the first in a multitude of services that is launched on the Ericsson IPMM subsystem. Other services are instant messaging, audio conferencing, interactive session forwarding and video telephony. [6]

All service classes supported by the WCDMA put requirements to the Radio Access and Core Networks. The involved nodes are able to handle control signaling, payload or both. The Mobile Switching Center (MSC) and

Gateway MSC (GMSC) have been used in GSM networks and provide control logic, payload processing and transmission. These nodes can be seen as logically divided into Server and MGw parts. [6]

Evolving from the GSM network the WCDMA MSC contains a control (Server) and a payload (Media Gateway) part. The tendency is to separate these functions to different nodes forming a layered network so a modern common Core Network is split as shown in figure 2: Mobile Softswitch Solution. [6]

The MSC, TSC and GMSC are nodes with similar functionality and same type of hardware. In the split architecture the MSC functionality related to control part is separated to the MSC Server node and the payload part to the MGW. The MGW is based on the Connectivity Packet Platform, (CPP), and is therefore called C-MGW. The role and functionality of MGw and MSC node is described in the next subsection. [6]

3.2 Mobile Softswitch Solution

Mobile Softswitch Solution (MSS) is based on Layered Architecture network design which separates, both physically and logically, service management and control (Control Layer) from transport of service data (Connectivity Layer), MSS is introduced in figure 2 below.

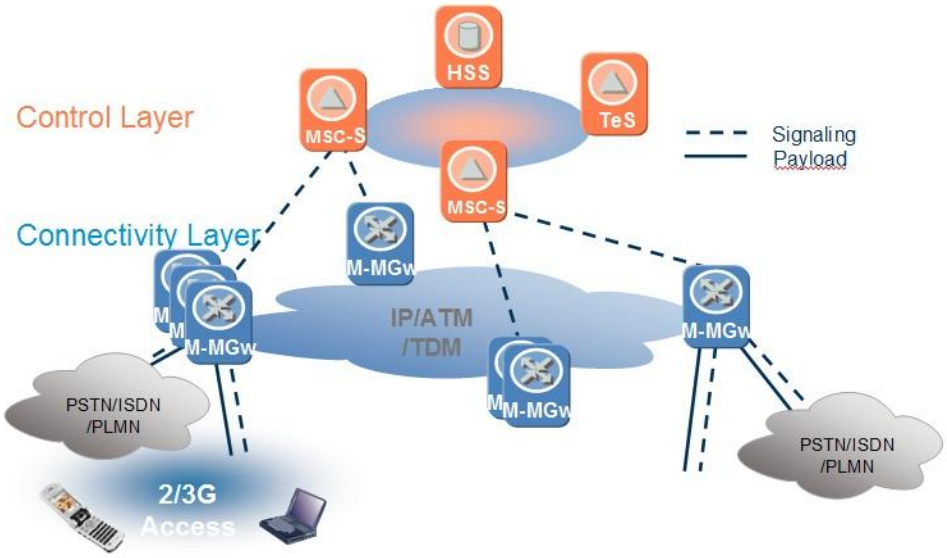

Figure 2: Mobile Softswitch Solution

Mobile Softswitch Solution is the combination of two different nodes: in the control layer is the MSC Server (MSC-S) and a connectivity layer is the Mobile Media Gateway (M-MGW). [7]

In the connectivity layer, Access and Backbone elements provide means for data transport and interfaces to legacy networks, such as the Switched Telephone Network (PSTN), other Public Land Mobile Networks (PLMN) and Integrated Services Digital Networks (ISDN). [7]

The control layer comprises the analysis and control functions required for circuit switched traffic and, using standardized signaling control, the allocation of required resources in the connectivity layer. [7]

In MSS, the connectivity layer is based primarily on Internet Protocol (IP) and Asynchronous Transfer Mode (ATM) protocols, providing end-to-end connection throughout the core network. The basic functionality of the MSC-S and M-MGW are:

- MSC-S handles all network signaling and intelligence for setting up, tearing down and monitoring circuit switched (CS) calls.
- M-MGW handles processing and transport of the CS call traffic and interconnection to external networks such as PSTN, other PLMNs and international telecom networks. [7]

3.2.1 Media Gateway

The main purpose of the Media Gateway is the processing of conversational data and handling of the transport network. Ericsson's MGW is an application based on a platform called Connectivity Packet Platform, CPP.

The Mobile Media Gateway (M-MGW) provides distributed switching by connecting mobile calls locally to other mobiles and landlines.

Main benefits of the M-MGW include:

- Distributed local switching at RNC, BSC (Base Station Controller) and other remote sites
- Easy scalability and high capacity within a single cabinet

- Compressed speech in the core network according to the 3GPP (3rd Generation Partnership Project) standard (improved speech quality is provided via speech enhancing functions)
- Automatic and dynamic capacity allocation between GSM and WCDMA traffic, PSTN interconnect and support for Time Division Multiplexing (TDM), ATM and IP interfaces in the same node
- Optimized platform design for real-time services requiring low delay
- Use of common processor boards to enable dynamic capacity allocation and handling of echo cancellation, voice-quality enhancements, transcoding, circuit-switched data, and code sending and receiving
- Fully integrated media stream processing in the M-MGw
- Support for flexible network design and MSC Server pooling through virtual media gateway functionality. [8]

The Ericsson WCDMA Core Network Architecture enables a complete separation of transport resources and device handling functionality, which resides in the Media Gateway node, from the control functionality, which resides in the MSC Server nodes. This interface, that uses the Gateway Control Protocol, GCP, is needed to allow the MSC Servers to remotely control the Media Gateway. [8]

In the split architecture, the Media Gateway handles payload processing, traffic and signaling interworking between networks.

Connectivity Packet Platform

The CPP platform uses a multi-processor control system. The multi-processor system is built on commercial processors and real time operating system with telecom and robustness additions. The internal transport system uses sub racks and is suitable for ATM, Synchronous Transfer Mode (STM) and IP networks solutions. The platform supports HW accelerated switching for ATM, (AAL2). The ATM Adaptation Layer (AAL) relays ATM cells between ATM Layer and higher layer. [6]

The CPP node consists of two parts:

- The application part that handles the software and hardware that are application specific and
- The platform part that handles common functions for all nodes needs.

The platform modularity makes it easy to create nodes and products with different configurations, functionality, capacity, reliability and performance levels. Figure 3: CPP structure. [6]

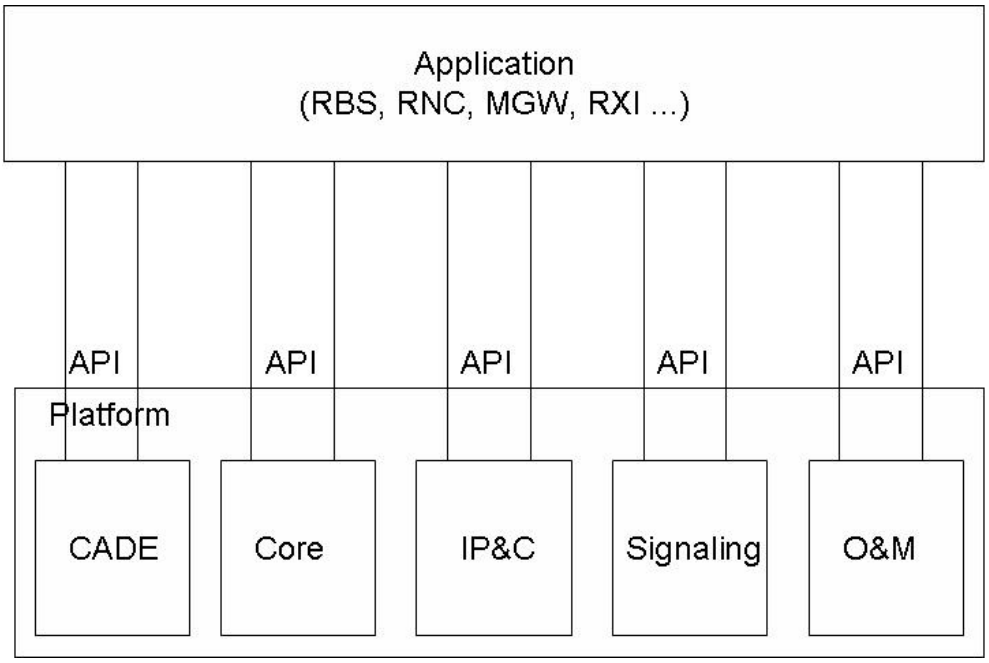

Figure 3:CPP structure

- API = Application Programming Interfaces
- CADE = CPP Application Development Environment
- IP&C = Internet Protocol and Connectivity
- O&M = Operation and Maintenance

The Platform part contains the following functional blocks:

- CADE (CPP Application Development Environment) is a software development environment for both CPP and Application software. It contains design, test, debug and build tools supporting the development in Main Board and special purpose Processors.
- Core or Execution Platform. It consists of software and hardware that applications need to execute correctly in a multi-processor environment. The CPP Core provides the following services to the applications:
  - A Software Execution Platform.
  - Java execution platform for management applications.
  - System upgrade during operation.
  - Space switching of ATM cells over multiple sub-racks within the node.

- § A real time redundant database with distributed access.

- IP&C. The IP and Connectivity provides Network synchronization, Transport services for both ATM and IP, and Exchange Terminal support.
- SS7. The Signaling System nr 7 provides the service for sending signaling messages between the nodes in a network.
- O&M. The Operation and maintenance part of a CPP node provides management services to applications and hardware. The Management network is based on Internet Protocol (IP) transport (IP over ATM) for remote management of the nodes.

The CPP layered architecture model makes it easy to introduce new nodes and applications in WCDMA Systems network. The CPP Based Nodes in the WCDMA Systems are the RBS, RNC, RXI and C-MGW. [6]

The CPP Media Gateway connects the Mobile Core Network (CN) with external networks such as WCDMA RAN and GSM RAN, PSTN or other Mobile Networks. [6]

3.2.2 Mobile Switching Center Server

The Mobile Switching Center Server (MSC-S) provides efficient and centralized control of the distributed switching provided by the Mobile Media Gateway (M-MGw), ensuring flexible, cost-effective network design, and a smooth evolution to an all-IP core network.

Features include:

- Call control for circuit-based services including bearer services, teleservices, supplementary services and charging and security
- User-plane-resource control for circuit-based services in the M-MGw
- Mobility and connection management with capabilities to support mobile multimedia
- Control of different transport networks including TDM, ATM and IP
- Support of GSM and WCDMA traffic control in the same node
- Hardware and software adjustment capabilities according to the mobile operator’s needs and dimensioning requirements. [9]

4 NETWORK DEPLOYMENT AND INTEGRATION

One of the Ericsson GSDC's functions is to configurate customers Media Gateway. There are two ways to configurate customer's node, upgrade process or Cold Start process. For this Ericsson has developed a specific document to help the experts work. This document is called Software Deployment Preparation (SWDP). With this SWDP process Ericsson employee knows what to do. SWDP process also describes the tools needed for the work. Next chapter introduces this SWDP process and the CCR-tool, which is one of the tools used in the SWDP process. CCR-tool is related to the CVbuilder.

4.1 Software Deployment Preparation

SWDP is a service at BUGS for delivery of customer specific SW and cold start or upgrade of the first node at new SW releases. This strategy drives lower cost, increased business and higher margins. Below is figure 4: the SWDP process, both M-MGW Cold Start process and M-MGW Release Upgrade Process.

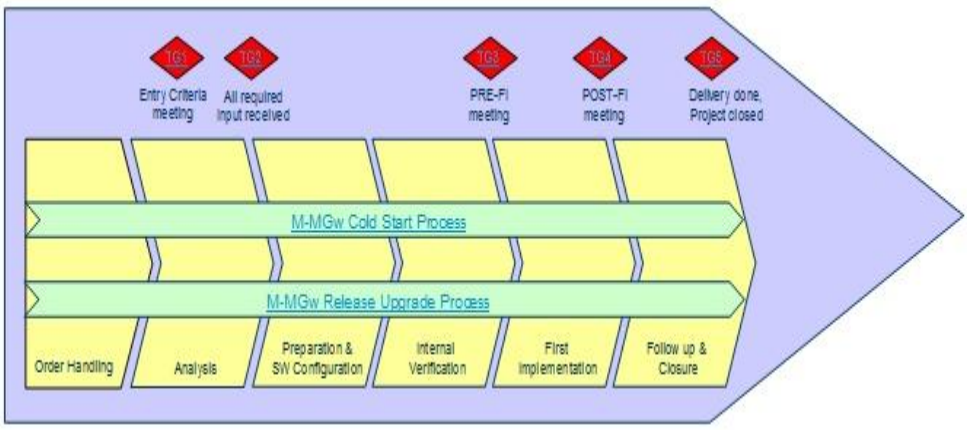

Figure 4: SWDP process

The SWDP Process contains the following sub-processes:

- Order Handling
- Analysis
- Preparation & Software Configuration
- Internal Verification
- First Implementation
- Follow up & Closure

Order Handling:

The purpose of Order Handling is to guide the ordering of the SWDP service correctly and to route the order to the appropriate GSDC. The GSDC needs to collect the correct information about the customer environment (both HW and SW) and requirements. This sub-process also includes license checking. The license check can be repeated at the end of the Internal Verification sub-process, just before delivery. [10]

Analysis:

The purpose of the Analysis sub-process is to collect relevant information such as customer requirements, resource and STP requirements, time plan requirements and upgrade requirements including roll-out to create a complete project plan. Test planning for the verification is also required. [10]

Preparation and Software Configuration:

The purpose of the Preparation & SW Configuration sub-process is to collect relevant information, to create a complete SW product including global SW with additions of required local adaptations (parameters, upgrade paths, SW, etc.) Another activity is the preparation of STP/STE for the internal verification that takes place in the subsequent sub-process. [10]

Internal Verification:

The Internal Verification is the activity to be performed to guarantee the required quality of the software that will be delivered to a specific customer. This verification can be generic or dependant on a customer specific configuration. Activities are test design, test execution, upgrade and functionality tests, fall back testing, fault report handling, modification handling, competence transfer, verification of parameter changes and quality upgrade checks. A second, optional SW license check can be executed in case this was left open during the Order Handling sub-process. [10]

First Implementation:

The First Implementation (FI) is the activity to introduce the new SW in a customer network in a specific node to guarantee the required quality of the software. The requested SW is loaded either in Cold Start or an Upgrade

node. After successful implementations a set of tests are done in order to verify that the new SW is has loaded successfully and that no secondary effects have occurred. Activities are on-site inspection (when applicable), Support during Integration, pre-upgrade tests, upgrade, post-upgrade tests, babysitting on request, implementation test report and implementation approval. In case the FI failed, a Route Cause Analysis (RCA) needs to be started. [10]

Follow up & Closure:

The Follow up & Closure sub-process contains the handover to the Support organization as well as the administrative and financial closure of the delivery / project. Activities are hand-over to support and rollout, post-FI meeting, final report (optional), sending out the Service Satisfaction Survey (as implemented by each GSDC), cost control and preparation for invoicing of actual cost in case there is. [10]

4.2 Customer Configuration Requirement -tool

Customer Configuration Requirement (CCR) tool supports information gathering of configuration data and efficient handling to import and produce node specific configuration scripts to facilitate an efficient network configuration and integration of nodes. [11]

Supported function

- CCR-form templates with network design parameters
- Managed Object (MO) script production from CCR-form
- Network Pictures production form CCRform
- Node import from Node CV to CCRform
- Test load of generated MO script
  - § Handled by CVbuilder (see chapter 5.1)

The CCR-tool system is a web based application and does not need any local installation on Personal Computer. However, to edit the CCRform files, requires a program that can handle .xls files. [11]

In Ericsson the CCR-tool is used to for e.g. MGw configuration. The configuration is done in CCR-forms, which are Excel workbooks. Each CCR-form corresponds to a specific data. Configuration data is gathered in the

CCR-forms, which are imported into CCR-tool. This creates a project, from which configuration scripts can be generated. These generated scripts go through the CVbuilder, which converts scripts to CV (Configuration Version). From CCR-tool point of view this is called test load. CV is a file set that represents the configuration of MGw. These CVs can be tested and finally used to configure a node. [11]

5 CONFIGURATION VERSION BUILDER

The purpose of this chapter is to describe Ericsson's tool called Configuration Version (CV) builder, to describe CVbuilder's operating principle and what it is used for. In addition also to describe what else is connected to CVbuilder and name the connected components.

CVbuilder is a network scripts verification program that reduces system expert errors. CVbuilder handles the test load functionality in CCR-tool. At the moment network scripts verification are done in System Test Plant (STP) nodes. There are also tested a new system called Connectivity Packet Platform Emulator (CPPEmu), which performances the same thing than STP node. CPPEmu is a software tool, which emulates CPP hardware.

CVbuilder is used only to verify MGw configuration scripts. CVbuilder is currently managed by GSDC Finland and CVbuilder's servers are located on the BETE premises.

This chapter is based on interviews of Ericsson's CVbuilder experts Juhani Kauppi and Juha Koistinen and also manager Peter Blomqvist.

5.1 MGw Configuration Building Process

CVbuilder is a help program used in the Media Gateway configuration building process. It enables a possibility to test load the configuration scripts produced by the Customer Configuration Requirement (CCR) -tool. The output received is a dump, so called CV, which includes all the networks configuration data needed for new MGw.

The figure 5 (see page 17) shows the logical parts in the MGw configuration building process.

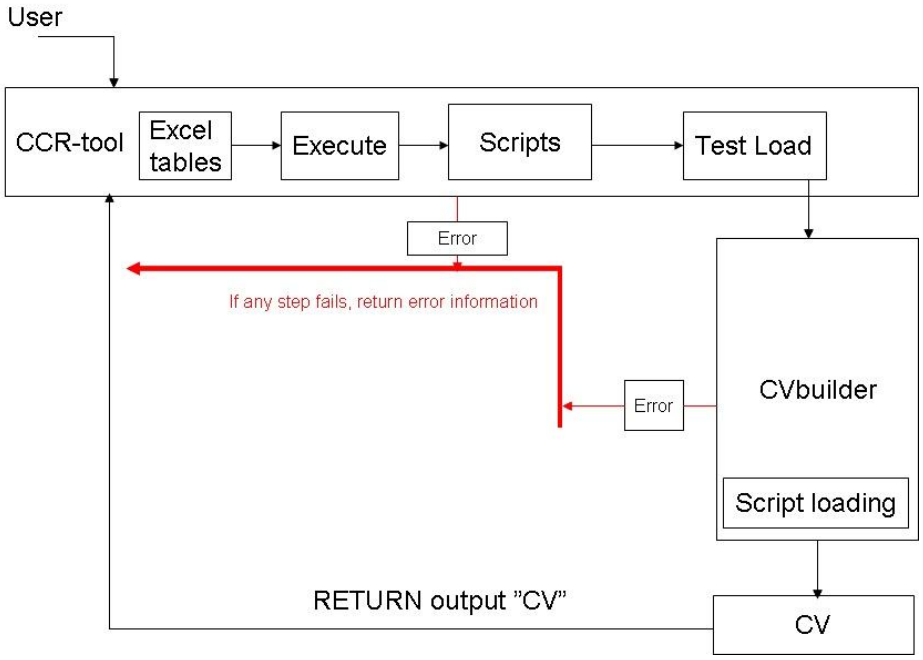

Figure 5: MGw configuration building

5.2 CVbuilder's CV Creation Process (CCR-tool test load)

As in previous chapter was described, Configuration Version (CV) builder is software that automatically creates MGw CV by loading MO –scripts to a test node. In this chapter the detailed functionality of CVbuilder is described.

The CVbuilder checks or executes the following actions:

- Constantly checks if input is received
- Checks what type of input is received
- Checks if the input is valid
- Checks what type of system is required (target MGw or emulator)
- Checks availability of chosen system
- Checks if the chosen system has the correct SW
- Fetches the correct SW from PDU FTP Server and loads it to the node if needed
- Restart the node with correct system CV
- Execute the configuration scripts received from CCR-tool
- If faults found puts them in Result info files and sends Result info and Status info files back to CCR-tool
- If no faults found, makes a data dump so called CV, which is sent back to CCR-tool
- Releases the node / emulator for other usage.

CVbuilder diagram (figure 6) describes the various stages of the CVbuilder CV creation process. In the figure there are different stages and these stages are described in the following. Numbering in figure 6 and figure 7 (see page 20) helps to understand the CVbuilder CV creation process.

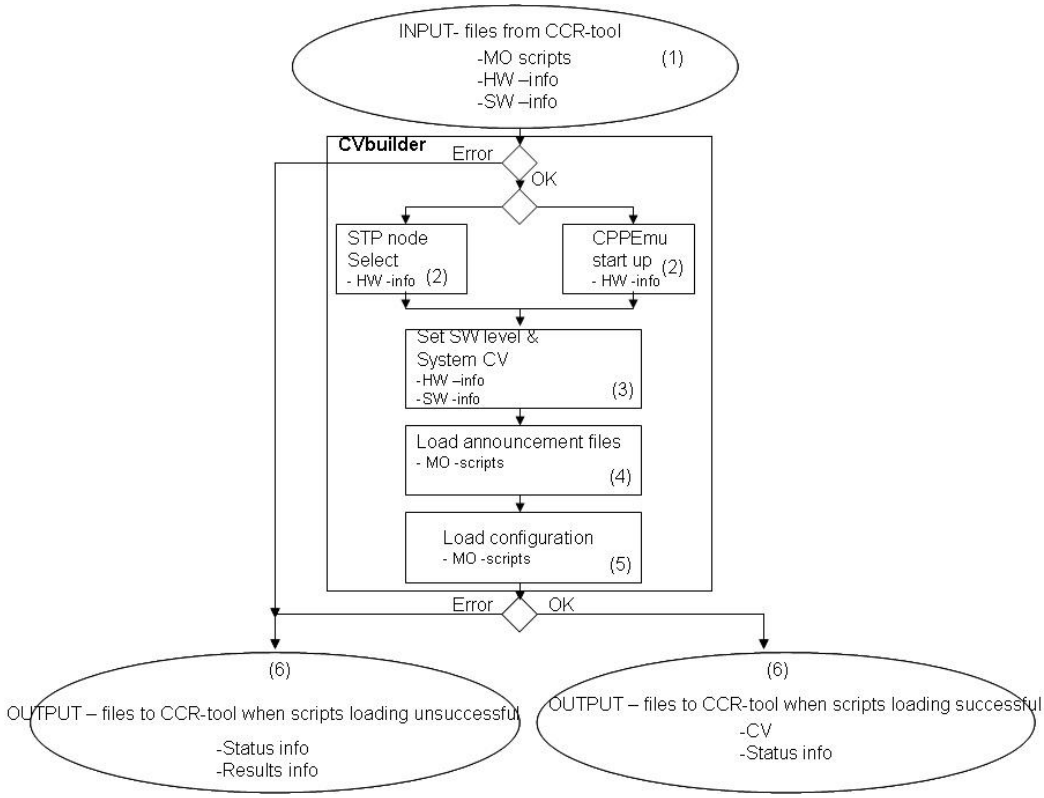

Figure 6: CVbuilder diagram

5.2.1 Input –files From CCR-tool (1)

The files, which are coming from CCR-tool, contain needed information for CV creation. Network configuration scripts (MO-scripts), Hardware Info and Software Info.

Hardware-info

Hardware-info contains the Basic Configuration (BC) data and optional board data.

Software-info

Software-info contains a string representing the software release in the target Media Gateway. e.g. R5.1.2.0.

MO-scripts

Managed Object (MO) -scripts contain the network level configuration data.

5.2.2 CPPEmu Start Up / STP Node Select (2)

CPPEmu start up

In this phase CPPEmu is started. When writing this document the realization of CPPEmu for test load purposes was under development.

STP node Select

System Test Plant (STP) node is selected based on Basic Configuration. (STP is introduced closer in chapter 3.1 CPPEmu / LMF STP). Optional board data is used to remove unnecessary boards from the node.

5.2.3 Set SW Level & System CV (3)

In this phase CVbuilder check if the needed software package is installed. If the correct SW package does not exist in the node, CVbuilder installs the SW. System CV contains the system level configuration data of Media gateway. System CV is selected by Hardware- and Software -info grounds.

5.2.4 Load Announcement files (4)

CVbuilder checks announcement files names in MO-scripts and creates the same files to the node.

5.2.5 Load Configuration (5)

In this phase CVbuilder loads MO scripts to the node and verifies that scripts are loaded successfully.

5.2.6 Output –files to CCR-tool when CV successful or unsuccessful (6)

When scripts loading successful

When scripts are loaded successfully, then The CV and Status info will be sent to the CCR-tool.

When scripts loading unsuccessful

When CV creation process founds an error, Status info and Result info will be sent to the CCR-tool. Result info contains the error information.

5.3 Related Components of CVbuilder

Above was analyzed how the CV is created in CVbuilder. To enable CVbuilder's CV creation process, CVbuilder must be connected to other components. CVbuilder is related to CCR-tool's FTP Server, Connectivity Packet Platform Emulator (CPPEmu), Product Development Unit (PDU) FTP Server and LM Finland (LMF) and System Test Plant (STP). All of these have roles in CVbuilder's CV creation process and these related components are described in the following figure 7.

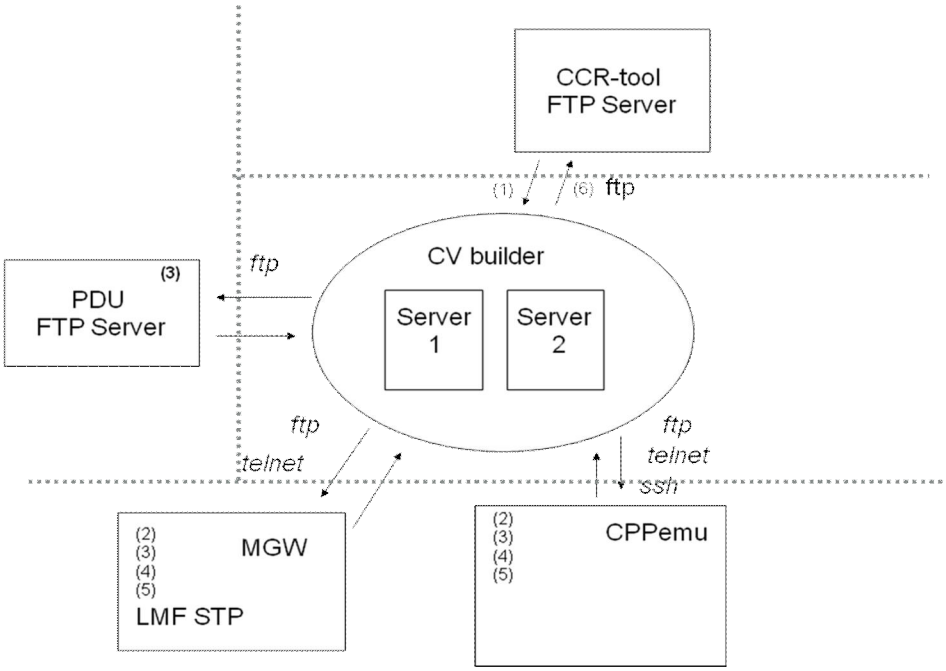

Figure 7: CVbuilder process

5.3.1 CPPEmu / LMF STP

From CVbuilder's point of view, CPPEmu and STP real node operate in same way.

CPPEmu

CPPEmu is a software tool. It is based on the Simics full system simulation platform from Virtutech. CPPEmu emulates the CPP hardware, which means all the processors, memory, disks, buses, IO devices etc. CPPEmu enables complete CPP software to be run in a host computer just as it was run in a real CPP node. For test load purposes, CPPEmu can be used as a replacement for an STP node. For data transmission between CPPEmu and CVbuilder, three protocols are used: FTP, SSH, and Telnet.

LMF STP

LMF STP is a test plant where MGw test nodes are located. CVbuilder is using only STP real nodes. FTP protocol is used to data transmission between MGw and CVbuilder.

5.3.2 PDU FTP Server

MGw Software can be found at the PDU FTP Server. When the correct software version needs to be installed, CVbuilder fetches the correct SW from the PDU FTP server and installs it. FTP protocol is used data transmission between PDU FTP Server and CVbuilder.

5.3.3 CCR-tool FTP Server

The input files from CCR-tool are put in queue on the CCR-tool FTP Server. CVbuilder communicates with CCR-tool FTP Server and checks if there are available files. CVbuilder downloads available files which go to the CVbuilder CV creation process. CVbuilder returns these processed files (CV successful or error) to the CCR-tool FTP Server.

6 PRODUCTIZATION

This chapter explains generally about productization and how it is produced in Ericsson. This is important because the purpose of this thesis is to productize CVbuilder for Ericsson.

6.1 Generally about productization

Productization is defining, planning, developing, describing and producing services that are offered to customers, so that the customers' benefits from the product are maximized, while the profit requirements of the company are realized. A product is productized when its license or property rights can be sold if needed. Productization can happen in different stages and it can proceed in phases. The first stage is to productize the inner methods of work and there the inner methods of work and procedures are being organized. The second stage is to develop a product support for the product. That means that the product uses the product support such as computer programs. In the third stage the product has been productized and there the structures, processes, methods and the tools are productized as far as possible. In the fourth and last stage the product is in a reproducible form and it can be distributed in physical or electrical form. Then the product is fully productized. [12]

By the help of productization a corporation can improve the equalization of different seasonal variations and hence also its utilization, efficiency and profitability. Productization can improve the corporations' utilization dozens of percents in on year. It also improves the quality for the same reason as productivity. [12]

Productization helps the customer to make the choice to buy the product and the customer recognizes a productized product from an un-productized one. It is also easier for the corporation to sell a productized product than un-productized one. By productization the corporation's property, reputation and profitability are improved and the corporation's value increases. [12]

6.2 Ericsson's Point of view of Productization

Ericsson uses the same methods in productization that are used generally, but has also its own methods. These methods are PRIM, GASK, PIwin and

CBST. PRIM and GASK are difficult to use and that is why Ericsson uses user-friendly windows based program called PIwin, which uses the PRIM and GASK databases. CBST is a standard library which includes all the standards related to Ericsson's internal and exterior products and documents. [13]

At Ericsson, a product exists only if its product number is found in the data contain in the central system PRIM. In the PRIM product data, the life of the product comprises different phases. These are numbering, reporting, registration, releasing and phasing out. [13]

There are two different ways to productize in Ericsson; Stand alone – productization which means that the product is productized individually and wide productization which means that the product is linked to another product. The productization of CVbuilder is made by using the Stand alone – method.

6.3 Corporate Basic Standards

Corporate Basic Standards (CBST) has the responsibility for basic standards within the areas of Product Data Management (PDM), Configuration Management (CM) (former Technical Administration (TA)) and EDM (Enterprise Document Management (non-product documentation)). [14]

Based upon corporate needs, Corporate Basic Standards will lead the development and maintenance of the necessary internal standards and to acquire usable external standards. [14]

Basic Standards are defined as the internal basic Ericsson rules for central terms, classification, identification, structuring, changes, traceability, responsibilities, status signals and codes for products and documents. Rules for common document layout and structuring are included in the standards and also supported in the form of Corporate Basic Templates. [14]

The standards provide the basic rules, on which all Information systems, central and local rules for handling of products and documents shall be based. The adherence to these rules by all information systems and business processes is crucial for the interoperability within Ericsson operations. [14]

The main objective for CBST is to develop and maintain a set of basic standards and guidelines and their associated services and tools within the main areas listed below.

- Terms and abbreviations
- Metadata for Products and Documents
- Product identification
- Document identification
- Product classification
- Document classification
- Revision rules
- Documentation rules
- Status codes
- Responsibility for generic/basic product structuring principles
- Document layout / Writing forms
- Marking and Traceability
- Standards for exemption handling
- Various basic rules

Within these areas CBST should, apart from the internal organizations, also maintain contacts with other parts of the industry, national and international standardization organizations that are acting and handling existing trends within these areas. [14]

The standards and terms owned by CBST are implemented in a number of systems, subsystems and functions, this in the central support systems and on the web. [14]

The following systems are the most important ones using and informing about the CBST rules:

- Central PDM and EDM systems like PRIM, GASK2, CDM and EriDoc, their clients and various other systems have the rules regarding numbers, basic attributes and codes built into them.
- The applications PRIM ABC-REG and its contents, handling ABC classes, ABC type-numbers, number series, number allocation and product names.
- The applications PRIM DEC-REG and its contents, handling Decimal classes and document names.

- The ABC/DEC-REG web client application, LXA 102 117 that presents the data from the PRIM ABC-REG and DEC-REG subsystems in a more easy-to read format. This system supports overview and search facilities regarding the product and document classification issues.
- The support system ESTER for handling of exemption requests and storing of approved exemptions. [14]

6.4 PRIM

Product Information Management (PRIM) is the common catalogue within Ericsson for managing products and documents. PRIM is a database which contains administrative information about products and documents. PRIM consists of a number of sub-systems for different purposes. Product information can be accessed through a number of clients; each designed for a specific environment. [15]

6.4.1 PRIM – the Database

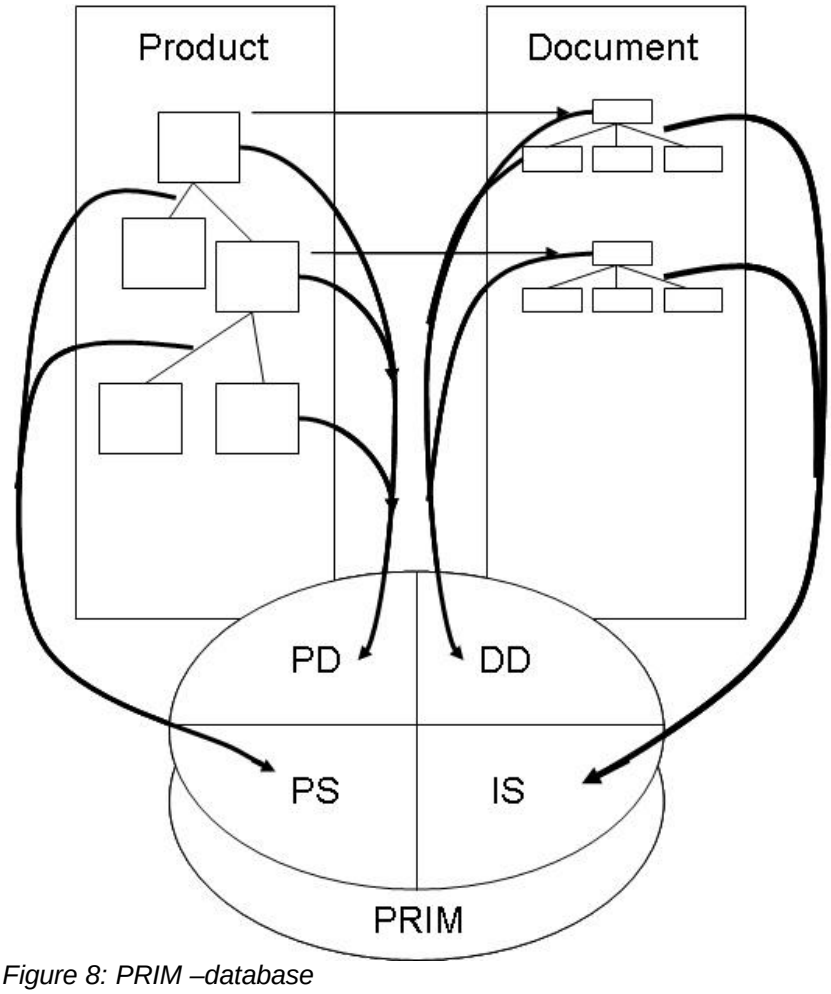

Figure 8: PRIM –database

PRIM is one database but it has four subsystems that contain different kinds of basic information (see figure 8). The first subsystem is called PD (Product Data). Product data provides with basic information about products, such as product number, product name, function designation, design responsibility, R-state, design status, release status and production status. [15]

The second subsystem PS (Product Structure) provides with present and historical information about the product structure that is structure specifications and manufacturing specifications of Ericsson's products from the system level, through the delivery level, down to raw material and components. [15]

DD (Document Data), the third subsystem, provides basic information about documents, such as, where the document is stored (archive), who is responsible for the document, and existing language codes and Rev-states. [15]

The fourth subsystem IS (Information Structure) provides information about the information structure for a product that is all information that is linked together for the specific product. [15]

6.4.2 Management of Products and Documents

Everything handled within Ericsson is either a product or a document. All products and documents are identified by their product or document number as well as a revision state. [15]

There are two numbering systems, the ABC system for products and the Decimal system for documents. These two systems are designed to work together to meet the multifarious requirements of Ericsson's complex business activities. [15]

The aim of these numbering systems is to obtain a single, unique identity that also makes it possible to distinguish between products and documents. [15]

6.4.3 Product Numbering

The product identification system is called “The ABC system”. Figure 9 describes the product numbering.

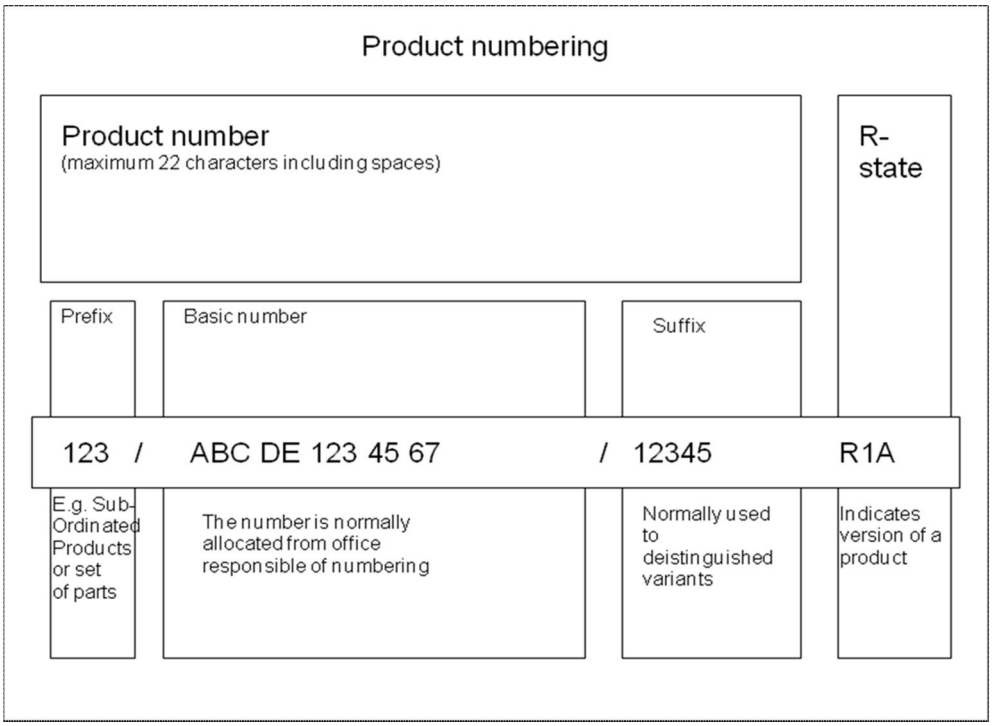

Figure 9: ABC system

Product identity consists of the basic number and R-state. *Product number* consists of a maximum of 22 characters including spaces. The meaning of a *prefix* in an ABC number can vary. It may for example be used to:

- Identify a subordinated product (partly equipped or assembled products), for example 1/ABC 123 45
- Identify a set of parts common for a number of products within the same ABC type, for example 1/ABC 123
- Give further information about a product, for example data for certain engineering components (#/SBA 131 040/06) or code for language (EN/LZT 101 09).

ABC type and sequence number are together referred to as the *basic number*. *ABC type* consists of ABC class, origin notation, and a three-digit type number. The ABC class consists of three capital letters which classify with reference to use design, and characteristics. The origin notation consists of one or two capital letters indicating design origin. Type numbers are allocated from the series 101 – 999. In order to prevent

misunderstanding in communication, even hundreds 100, 200 – 900 must not be used. *Sequence numbers* consist of two, three or four digits and are used to distinguish products of the same type.

A suffix is as a rule used to distinguished variants with the same basic number. Digits and letters may be mixed. The *R-state* indicates the revision state of the product. [15]

6.4.4 Document Numbering

The document identification system is called “The Decimal system”. Figure 10 describes the document numbering.

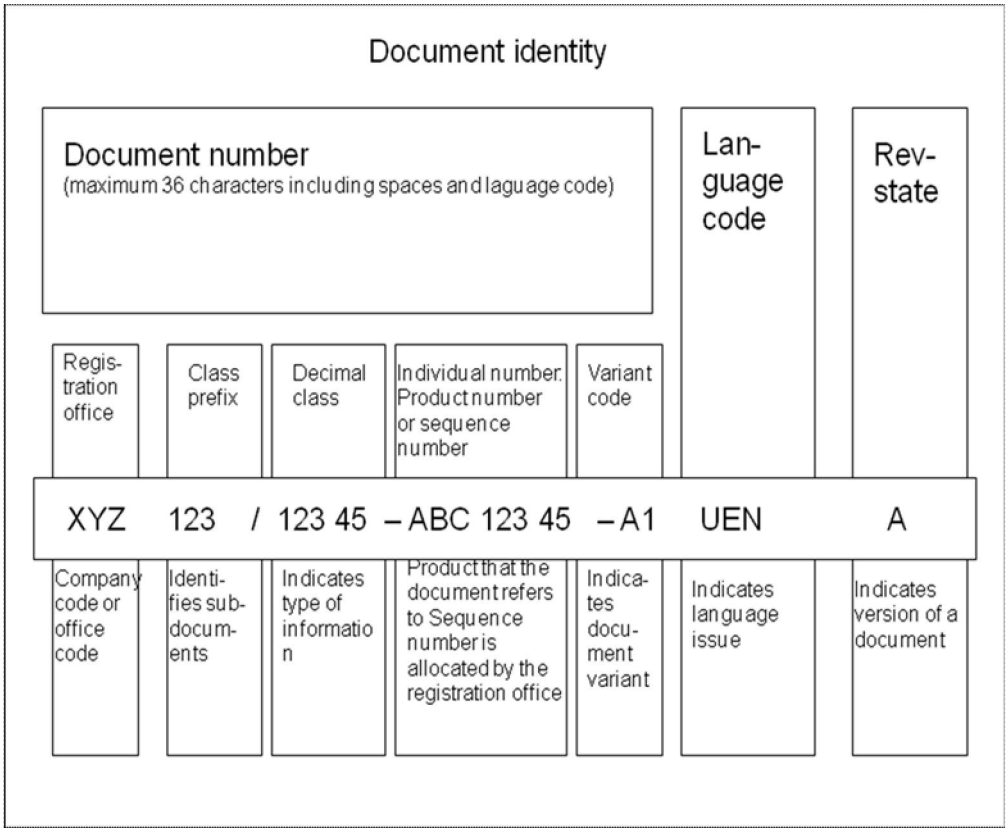

Figure 10: Decimal system

Document identity

The *document identity* consists of the document number, the language code and the Rev-state. The *document number* consists of a maximum of 36 characters including spaces and language code. *Language code* indicates language of the issue. The *Rev-state* indicates the revision state of the document. [15]

The notation for the *registration office* is in certain cases in the document number. A document sometimes needs to be divided into several parts (subdocuments), to facilitate handling. These subdocuments are identified by a prefix placed in front of the decimal class. The *class prefix* is numerical and starts as a rule with 1 and runs in sequence. [15]

A *decimal class* consists of four or five digits. Only registered classes may be used. *The individual number* may be a product number (ABC number) or a registered sequence number. (ABC number) *Product numbers* are used for documents referring to products. A product number consists of class, type, or basic number with or without suffix or prefix, or both, depending on the extent of the document. Sequence numbers are used for documents of a general nature, instructions, rules, etc. A *sequence number* consists of three, four, or five digits and starts with 101 and runs in numerical order. A sequence number is allocated by the registration office administrating the document. Both suffix and prefix may be used in a sequence number. [15]

A document created from an existing document version is called a document *variant (variant code)*. The document number for a document variant consists of the document number of the origin document supplemented by its Rev-state letter and a digit. [15]

6.5 GASK2

General Archive System for Communication (GASK) 2 is an archive system where information (documents) is stored. A document consists of two parts; the document itself and the administrative information that is stored together with the document. The administrative information includes, for example the document number, the document revision state, the document status, and the data format. [16]

In PRIM only the document administrative information is stored and in GASK2 both the administrative information and the document itself are stored. [15]

The purpose for the GASK2 archive is to provide an archive common to the entire Ericsson Corporation where information can be stored, and from which documents can be fetched and browsed. [16]

Information stored in the GASK2 archive always consists of the following two parts:

- Actual information (the document)
- Document administrative information (about the document)

Actual information can be readable information or non-readable information. The readable information consists of documents that are made to be read and printed. The non-readable information can, for instance, be information intended for a robot. The information stored in the GASK2 archive is called a document whether or not it is readable. [16]

6.6 PIwin

PIwin is a Windows application for accessing and managing product information and data. With PIwin is easy access to PRIM data possible and documents stored in GASK2. [17]

One major benefit is that PIwin encapsulates these applications (PRIM, GASK2, etc.) into one single interface. As a user, there is no need to know whether the information is actually kept in PRIM, GASK2 or someplace else. PIwin can take care of finding the information what will be needed. [17]

6.7 Productization of CVbuilder

CVbuilder was productized by using PIwin program. With PIwin there are three ways to register a new product - you can use the Create Product Wizard or start from scratch or copy data from an existing product. Following is a sample of how the productization was made.

6.7.1 CREATE PRODUCT (ABC class)

This work was done by using the Create Product Wizard operation.

To register a new Product

The Create Product Wizard will guide through the steps of creating a new product with its most common properties. This Create Product Wizard will be found from the toolbar of PIwin (File – New – Product –Wizard) Figure 11: Create Product Wizard (See page 31).

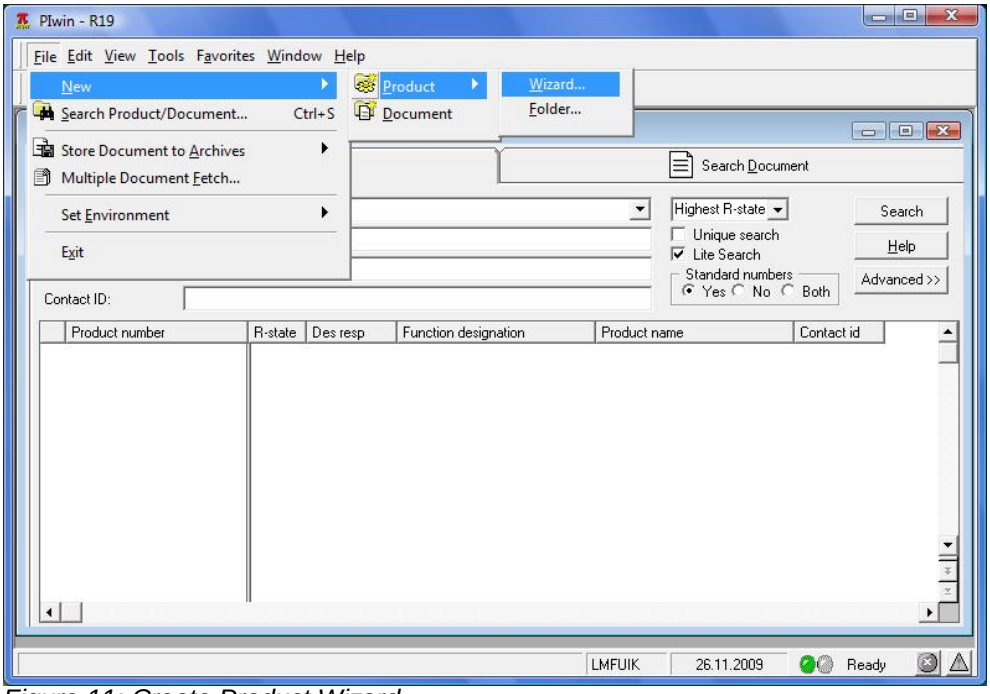

Figure 11: Create Product Wizard

At the Design responsible department part, should be given company and office code for design responsible department. Figure 12: create new product.

Figure 12: Create new product

In this step the Class and the Type parameters were given. The Class parameter was gotten from ABC-register and the Type parameter was gotten from DEC-register. Figure 13: Class and Type parameters.

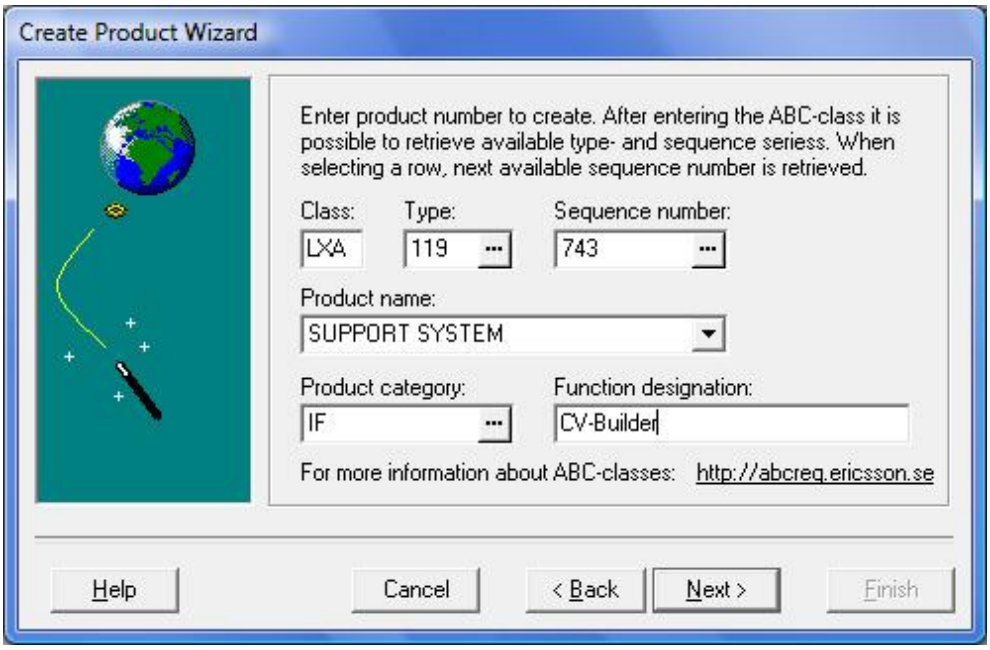

Figure 13: Class and Type parameters

In this step the R-state and the Contact ID was given. The R-state is additional notation to a product's number identifying a specific product version. The Contact ID is the signer for the person responsible. Figure 14: R-state & Contact ID.

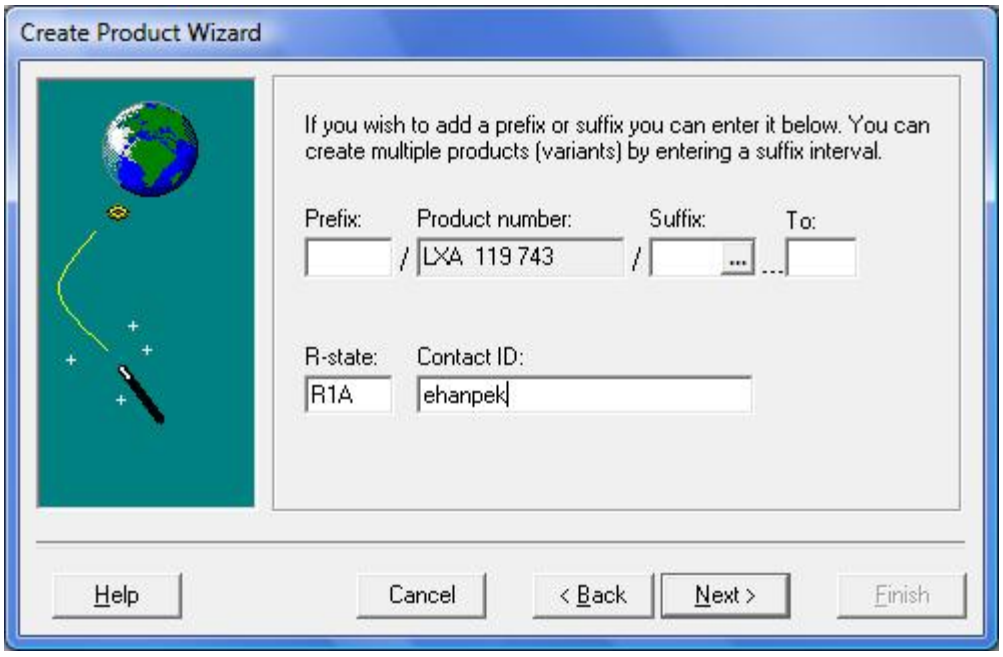

Figure 14: R-state & Contact ID

In this step work is in standby mode and settings can be checked. Figure 15: Standby mode.

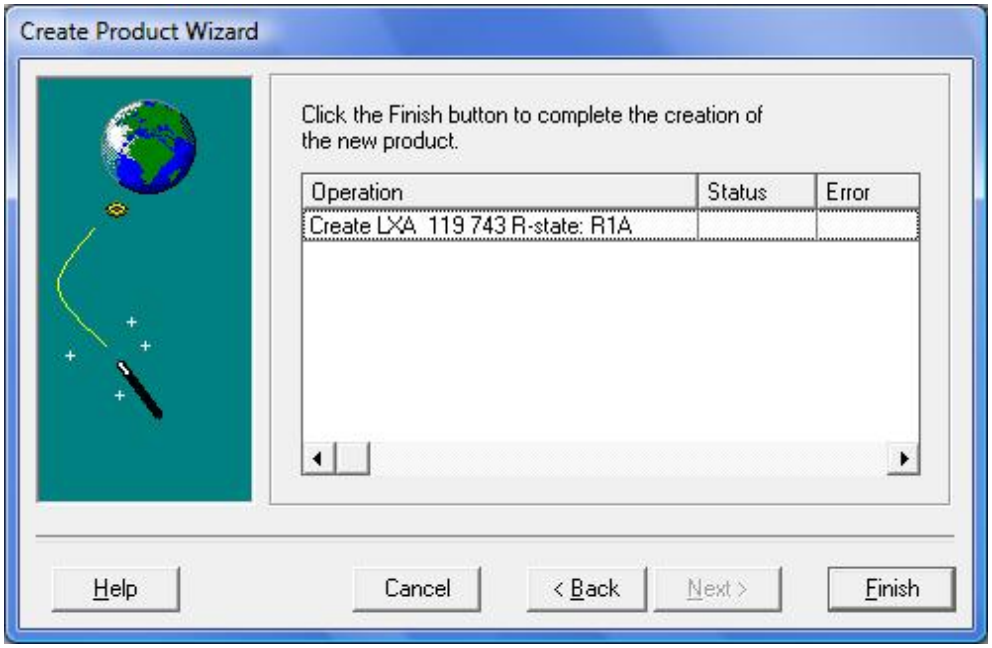

Figure 15: Standby mode

In this step the Status shows when the work is done. Figure 16: All operations performed.

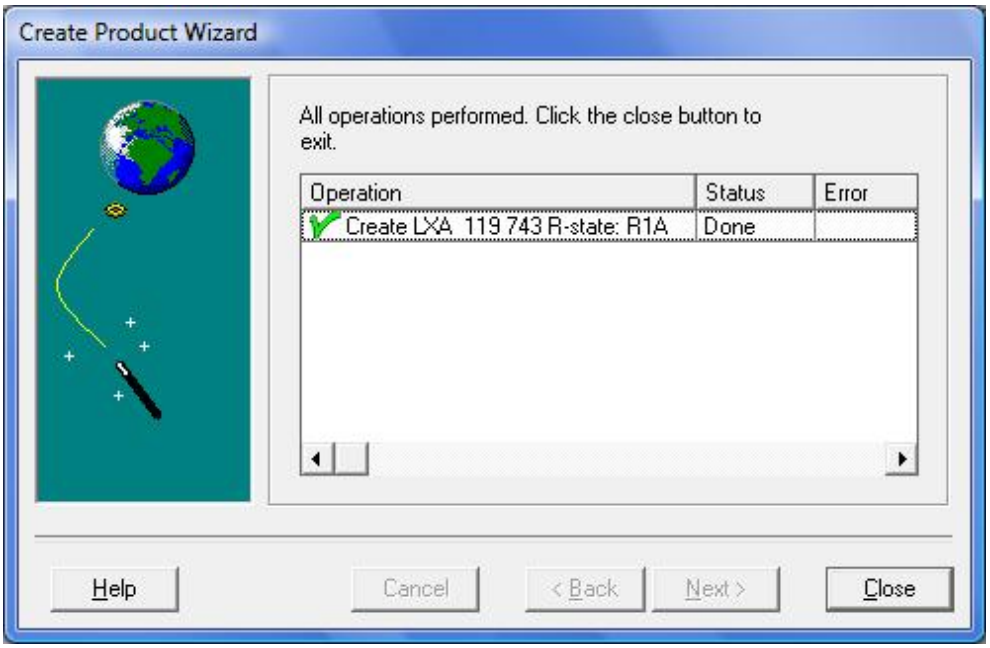

Figure 16: All operations performed

In this step it is examined the created work. This function opens the Product Explorer. Figure 17: View created product.

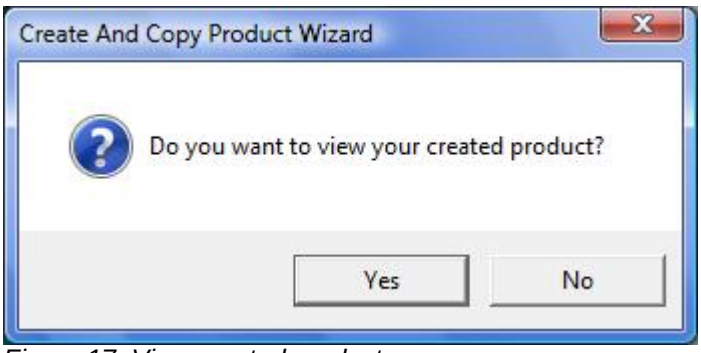

Figure 17: View created product

CREATE 1095- (Document Survey) (Decimal register)

The Information Structure item is divided into three sections: Information Structure Overview, Sub folders for specific Information Structure type and Create Structure/Column. In this work the new product was created, so Create Structure / Column was selected. Figure 18: Information structure.

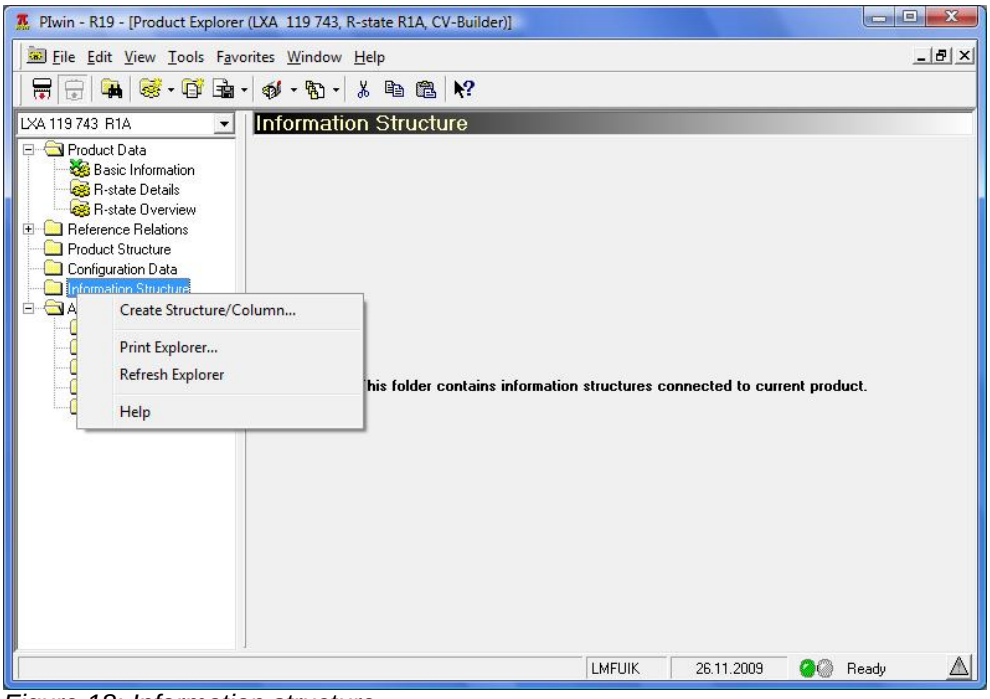

Figure 18: Information structure

At this stage the Product nr and R-state parameters were given. Figure 19: Add R-state column.

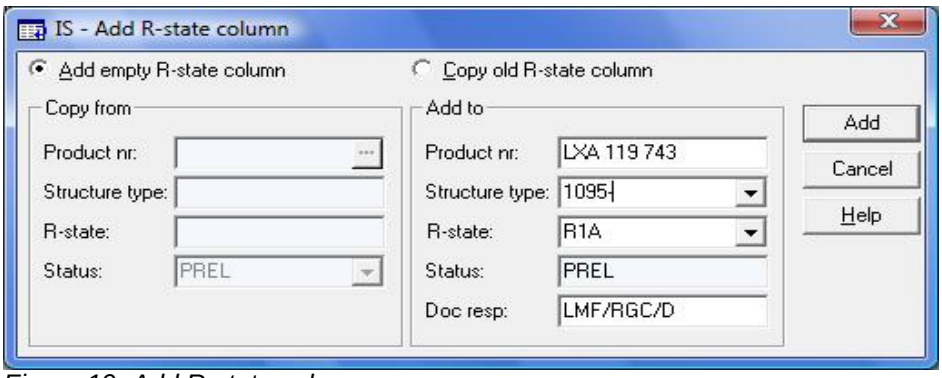

Figure 19: Add R-state column

The R-state phase was added and the message “Information Structure successfully added” occurred. Then refresh the Product Explorer. Figure 20: Information structure successfully added.

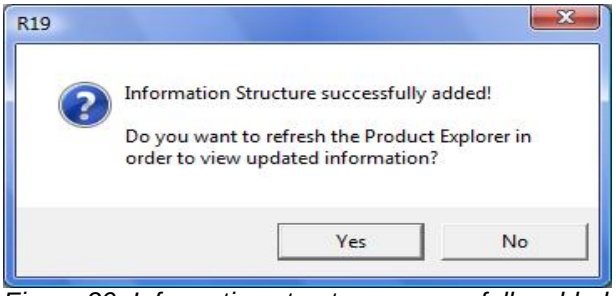

Figure 20: Information structure successfully added

Created survey document will be displayed information structure in 1095 - PREL (R1A). Figure 21: 1095 – information structure.

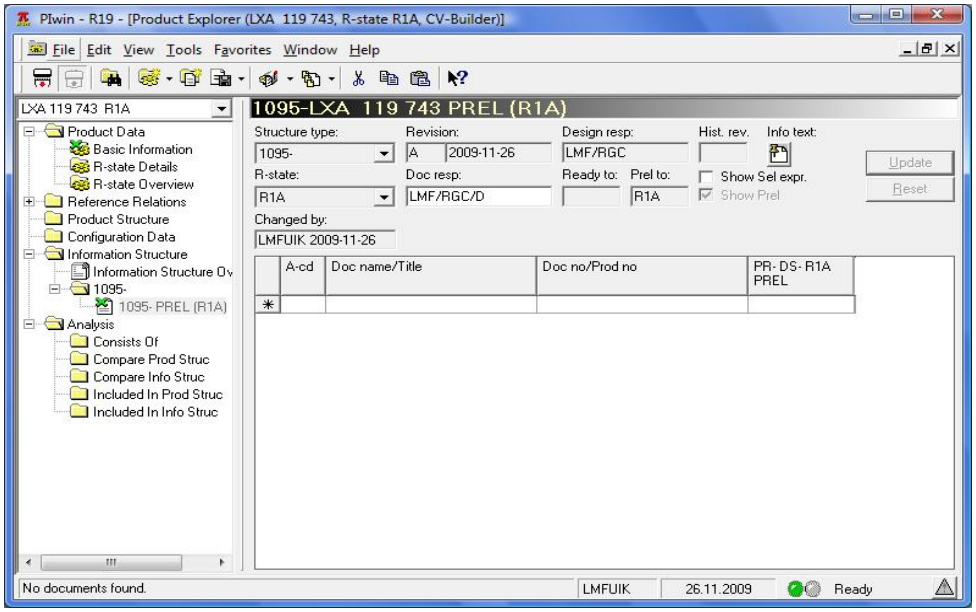

Figure 21: 1095 - information structure

6.7.2 Store Document to PIwin/GASK

In the following is introduced document storing in GASK2 database using PIwin application. GASK2 storage takes the using following means. File -> Store Document to Archives -> GASK… Figure 22: Store document to GASK2.

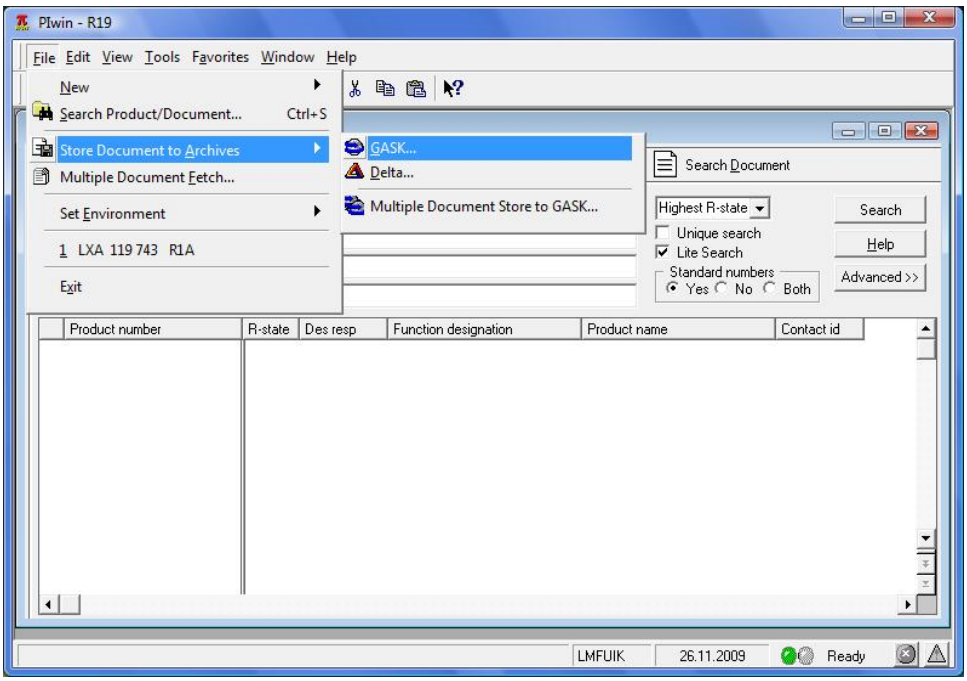

Figure 22: Store document to GASK2

In this step File to store, Document number, Status, Document resp, Subject resp, Document name, Language code, Rev state, Document type, data format and character set menus are mandatory to be filled. First the document was fetched to File to store –function, then the program fulfills part of the information. After that, fill the missing information (see page 37) figure 23: GASK, fill out the information.

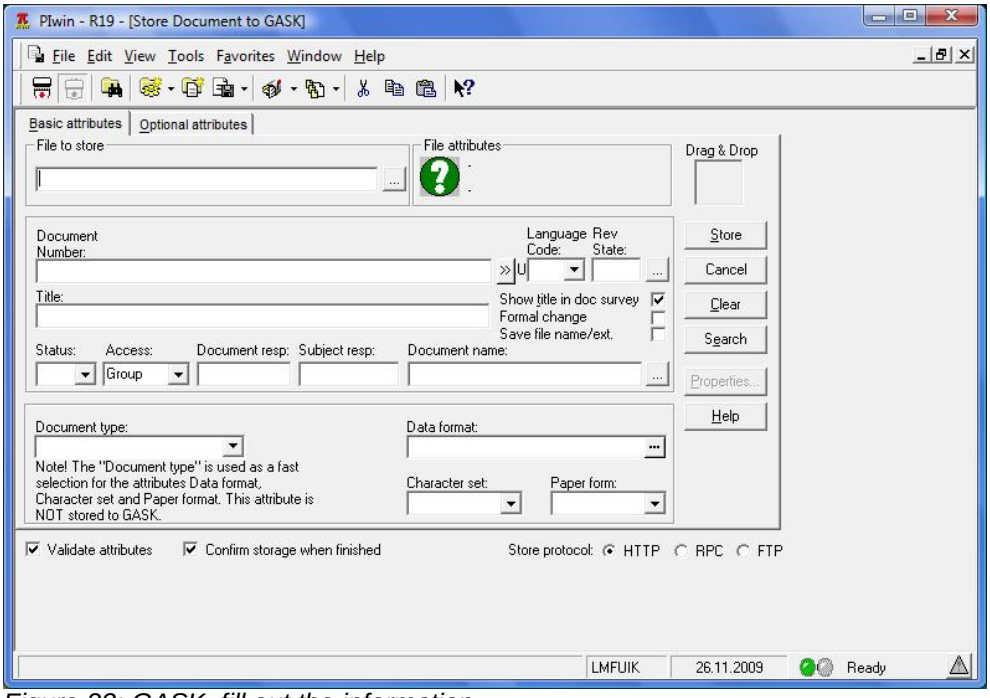

Figure 23: GASK, fill out the information.

The information filled out figure 24: GASK, the information filled out and now it is ready to storing the GASK2.

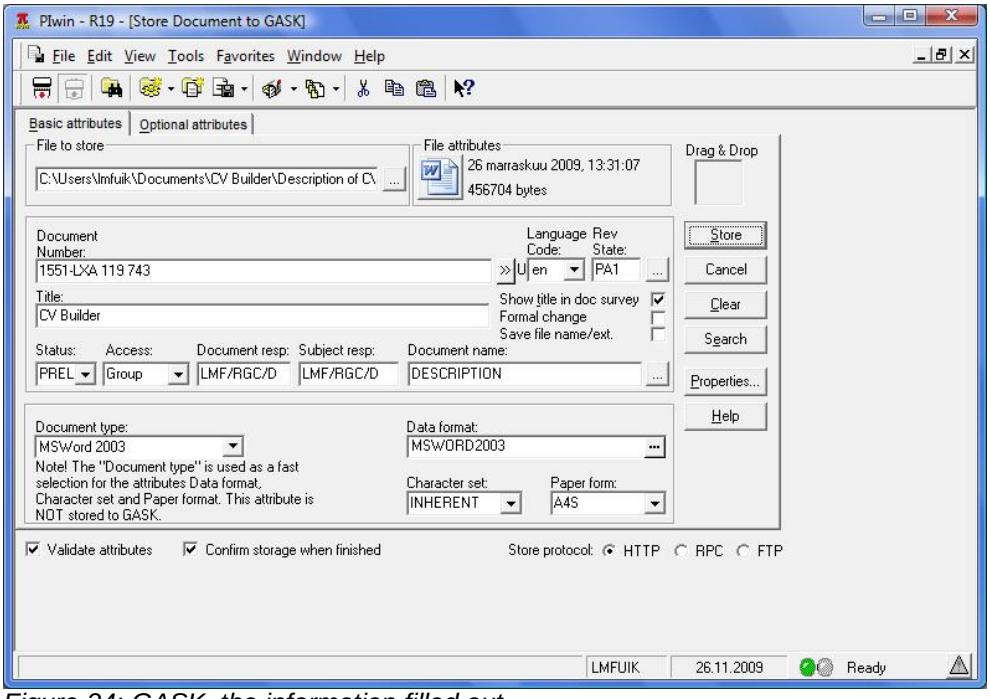

Figure 24: GASK, the information filled out.

In this step the created product number and the stored document are connected. Now CVbuilder can be found in the Ericsson database for example using the PIwin program figure 25: PIwin search.

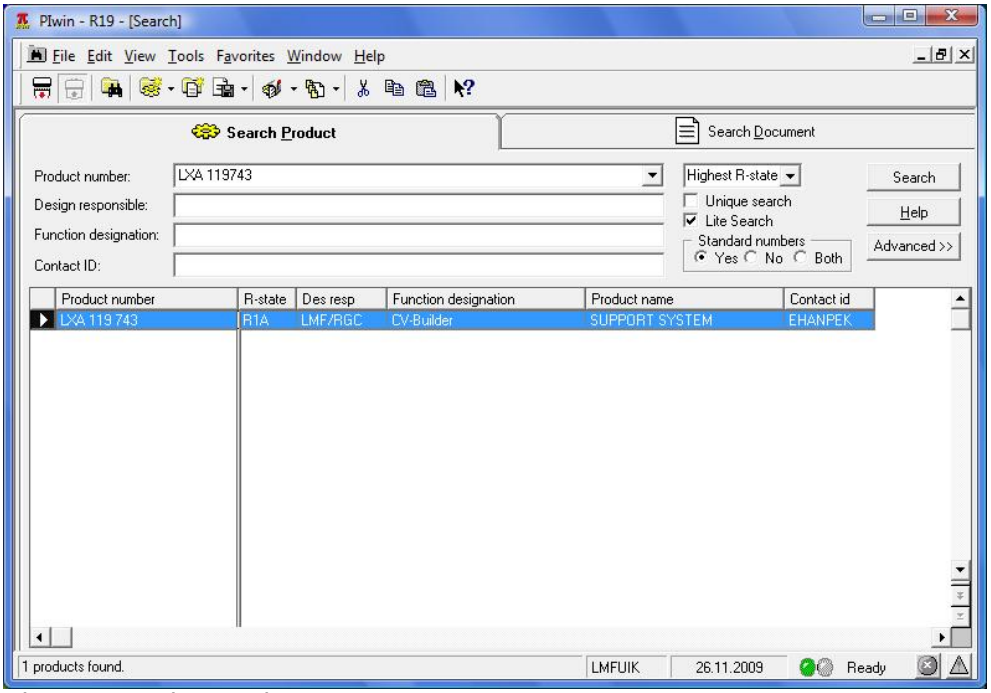

Figure 25:PIwin search

7 CONCLUSION

The purpose of this thesis was to productize CVbuilder and clarify which of Ericsson's departments could take control of the CVbuilder. Ericsson has been planning to productize CVbuilder for some years, but due to insufficiency in resources this could not been done in until now.

Before I was given this topic for thesis in Ericsson, I studied Ericsson's own internal e-learning courses for example about various departments of Ericsson. I also studied topics about my department, such as Ericsson Mobile SoftSwitch Solution and how it is implemented in Ericsson. After receiving the topic of my thesis I went to HoT -course that included training about Media Gateway, tools what are in used for configuration of MGw and the operating principles of MGw. In addition, to this thesis a few experts from Ericsson have been interviewed about CVbuilder and productization.

The making of thesis was started by discussing with the developer of CVbuilder, the thesis instructor and my manager. There were quite a few discussion times and they were important because there was no kind of document written before about the CVbuilder so it was hard to find anything written about it. From these discussions, I wrote the first drafts of this document and modified them more together with my instructor.

At the beginning the productization of CVbuilder seemed to be difficult and complicated, because there are so many things to be considered in the productization process. For example there should be taken notice of the laws of different countries where the product is to be exported. In addition, Ericsson's product standards (Corporate Basic Standards) seemed to be difficult to be read. Fortunately received help from one of Ericsson's expert, who advised me in the different stages of the productization process. The productization decided to be made by a Stand alone -method, which means that the registration of the product is being done as a separate product. Before the productization of the CVbuilder a document was written with the Corporate Basic Standards –steps. This document is based on the chapter 6 of this thesis, Configuration Version Builder. After writing the document, the CVbuilder was productized by using the PIwin program. The program itself was easy to use and the productization process done smoothly as long as

you had solved the product number and had made a documentary, according to the standards.

The purpose of this thesis was also to find out what Ericsson’s department could take control of the CVbuilder. Ericsson has three different departments, which could do it. These departments are the Ericsson’s Business Unit Global Service (BUGS), Global Service Delivery Center (GSDC) and Business Unit Ericsson Test Environments (BETE). When doing this thesis CVbuilder was under GSDC's control, but it had no proper maintenance. GSDC has, however, the greatest expertise of CVbuilder. Solving of the management of CVbuilder was not completed. The interview of manager happened at a manager level and when the issues are at this level everything happens by the book and very slowly. Because all the expertise of CVbuilder is currently the GSDC, my opinion is it would be the best to keep CVbuilder under GSDC's control. On the other hand, BETE manages all the test equipments in the same place where the CVbuilder is located.

The next step in developing CVbuilder would be for example re-organizing its code and documenting it. To do this, could outside help, such as Product Development Unit (PDU), be hired to organize and develop the code. The department which manages the CVbuilder could hold its maintenance, which would ensure its operation and, if errors should occur, this should inform PDU's coder. This would enhance the reliability of the CVbuilder and the product could be sold forward.

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